Attorney's Docket No. 1030681-000649

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	
Kwang-ki Choi et al.	Group Art Unit: 2828
Application No.: 10/823,653	Examiner: ARMANDO RODRIGUEZ
Filed: April 14, 2004	Appeal No.: _____
For: SEMICONDUCTOR LASER DEVICE	

APPEAL BRIEF

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the decision of the Primary Examiner dated August 13, 2007 finally rejecting claims 1 and 9, which are reproduced as the Claims Appendix of this brief.

☐ A check covering the ☐ $ 255 ☐ $ 510 Government fee is filed herewith.

☒ Charge ☐ $ 255 ☒ $ 510 to Credit Card. Form PTO-2038 is attached.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

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I. Real Party in Interest

The present application is assigned to Samsung Electronics Co., Ltd. Samsung Electronics Co., Ltd. is the real party in interest, and is the assignee of Application No. 10/823,653.

II. Related Appeals and Interferences

The Appellant's legal representative, or assignee, does not know of any other appeal or interferences which will affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of Claims

A. There are 16 total claims currently pending in the application.

B. Current Status of Claims

1. Claims canceled: None

2. Claims withdrawn from consideration but not canceled: None

3. Claims pending: 1-16

4. Claims allowed: None

5. Claims containing allowable subject matter: 2-8 and 10-16

C. Claims rejected: 1 and 9

IV. Status of Amendments

An Amendment was filed subsequent to the final Office Action on July 27, 2007. In an Advisory Action dated August 13, 2007, entry of the Amendment was denied.

V. Summary of Claimed Subject Matter

The instant application is directed to a semiconductor laser device including a multi-semiconductor material layered mesa structure having a laser resonance layer on a substrate and cladding layers formed over and below the resonance layer (pg. 6, lines 17-27; Figure 5). The semiconductor laser device includes rounded corners connected to the substrate, in a lower portion of the mesa structure (pg. 8, lines 3-7; Figure 5). A passivation layer is formed on the mesa structure and has a contact hole exposing an upper surface of the current injection ridge (pg. 7, line 33 through pg. 8, line 2).

The Table, which follows, maps Appellant's independent claims to those portions of the disclosure that support the recited features.

Claim #	Claim element	Support
Claim 1	A semiconductor laser device, which includes a multi-semiconductor material layered mesa structure having a laser resonance layer on a substrate and cladding layers formed over and below the resonance layer, comprising:	pg. 6, lines 20-27
	rounded corners connected to the substrate, in a lower portion of the mesa structure;	pg. 8, lines 3-7
	a current injection ridge formed on an upper portion of the mesa structure and protruding from an upper surface of the mesa structure; and	pg. 7, lines 19-22
	a passivation layer formed on the mesa structure and having a contact hole exposing an upper surface of the current injection ridge.	pg. 7, lines 33 - pg. 8, line 2
Claim 9	A semiconductor laser device, which includes a multi-semiconductor material layered mesa structure having a laser resonance layer on a substrate and cladding layers formed above and below the resonance layer, comprising:	pg. 6, lines 20-27
	rounded corners connected to the substrate, in a lower portion of the mesa structure;	pg. 8, lines 3-7
	a current injection ridge and force distribution ridges formed on an upper portion of the mesa structure and protruding from an upper surface of the mesa structure; and	pg. 7, lines 19-22 pg. 8, lines 25-28

Claim #	Claim element	Support
	a passivation layer formed on the mesa structure and having a contact hole exposing an upper surface of the current injection ridge.	pg. 7, lines 33 - pg. 8, line 2

VI. Grounds of Rejection to be Reviewed on Appeal

The claims on appeal are rejected in the final Office Action under the following grounds:

Claims 1 and 9 are rejected under 35 U.S.C. §102(e) as anticipated by *Nakamura et al.* U.S. Patent No. 6,798,807.

VII. Argument

Nakamura fails to disclose every element recited in claims 1 and 9

The presently claimed invention addresses problems associated with scribing light emitting surfaces. When light emitting surfaces are scribed, a cleavage plane is formed on the light emitting side. However, when a ridge waveguide structure is formed on an upper cladding layer, a scribing force is transferred from the substrate to a lower portion of a mesa structure and the ridge at the upper portion of the mesa structure, results in the scribing force being too concentrated and leads to non-uniformity cleavage planes. In other words, the shapes of the cleavage planes are different from chip to chip even when the chips are manufactured under the same scribing conditions. When scribing the mesa structure, by transferring the scribing force from the substrate to the mesa structure, the scribing force is concentrated on a lower corner of the mesa structure so that cracks occur at the lower corner of the mesa structure. The dotted triangle shown in Appellant's Figure 3 illustrates cracks in the cleavage plane and the light exiting surface.

The device structure embodied in the recitations of independent claims 1 and 9 addresses the above-stated problems. For example, claim 1 recites a semiconductor laser device that includes a multi-semiconductor material layered mesa structure having a laser resonance layer on a substrate and cladding layers formed over and below the resonance layer. The semiconductor laser device

includes rounded corners connected to the substrate, and a lower portion of the mesa structure.

Independent claim 9 is similar to claim 1, but recites, in part, that a current injection ridge is accompanied by force distribution ridges formed on an upper portion of the mesa structure, and which protrude from the upper surface of the mesa structure.

Contrary to the position taken by the Patent Office (PTO) in the final Office Action, *Nakamura* fails to disclose Appellant's claimed combination of features. Namely, the device described by *Nakamura* does not include neither rounded corners connected to a substrate as recited in Appellant's claims.

Nakamura discloses a semiconductor laser that comprises a multilayered semiconductor layer that includes an active layer on a main surface of a semiconductor substrate 2 and an anode electrode 25 and a cathode electrode 26 on an upper surface of an area 33 of the device. A ridge 16 is formed by a protruded portion interposed between two trenches 15 such that when a predetermined voltage is applied between the anode electrode 25 and the cathode electrode 26, laser light is emitted from an end of the active layer corresponding to the ridge 16. *Nakamura* also discloses that a first isolation trench 31 is provided on one side of the ridge 16 and a second isolation trench 32 is formed on another side of the ridge 16. As shown in Figures 1 and 11-16, for example, only the isolation trench 32 is connected to the substrate.

Among other features, Appellant's claims recite that rounded corners are connected to the substrate in a lower portion of the mesa structure. Because the claim term "corners" is plural, Appellant's claims recite that more than one corner of the mesa structure is connected to the substrate. *Nakamura*, on the other hand, shows that only one trench (which the PTO interprets as being analogous to Appellant's claimed rounded corners) is in the substrate. *Nakamura* discloses that the trench 31, which is formed adjacent to the area 33, does not come in contact or connect to the substrate 2. At best, trench 31 connects to the active layer 6. As a result, the area 33 only has one corner, which is defined by trench 32 that connects to the substrate.

Appellant respectfully submits that the inventions claims 1 and 9 are directed to are not anticipated by the applied art. A review of the prior art reveals that the applied art does not appreciate the problem of the prior art identified in the present application, nor does it suggest that rounded corners provide a solution to any problem, such as preventing concentration of a scribing force. The isolation trench 32 of *Nakamura* is generated by merely etching multilayered semiconductor layer with a photoresist film 41a as an etching mask. Apparently, etching masks are used to transfer its planar pattern and the depth of etching is generally uniform within an engineering tolerance unless the width of the trench 32 is adjusted to generate a specific shape, such as a V-shaped trench in Figure 29 of *Nakamura*. There is no supporting disclosure suggesting that the curve in the line at the corner was intentional or actually apparent in the device as designed or made. What is more is that the present claims require the corner to be "rounded," which would exclude minor transitional gradients due to etching tolerances. These incidental curvatures, if they exist, are not deliberately "rounded" as required in the claims. As such, if the trench 32 has rounded corners, the rounded corners would simply represent technical by-product in etching the trench 32 of the system described in *Nakamura*. The fact that trenches 31 and 32 are of different depths seemingly supports this position as there is no evidence that the depths of the trench structures serves a purpose related to preventing the concentration of a scribing force.

To properly anticipate a claim, the document must disclose, explicitly or implicitly, each and every feature recited in the claim. *See* Verdegall Bros. v. Union Oil Co. of Calif., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). For at least these reasons, Appellant respectfully requests that the rejection of claims 1 and 9 under 35 U.S.C. §102 not be sustained.

VIII. Claims Appendix

See attached Claims Appendix for a copy of the claims involved in the appeal.

IX. Evidence Appendix

See attached Evidence Appendix for copies of evidence relied upon by Appellant.

X. Related Proceedings Appendix

See attached Related Proceedings Appendix for copies of decisions identified in Section II, supra.

Respectfully submitted,

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Date October 25, 2007

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VIII. CLAIMS APPENDIX

The Appealed Claims

1. (Previously Presented) A semiconductor laser device, which includes a multi-semiconductor material layered mesa structure having a laser resonance layer on a substrate and cladding layers formed over and below the resonance layer, comprising:

rounded corners connected to the substrate, in a lower portion of the mesa structure;

a current injection ridge formed on an upper portion of the mesa structure and protruding from an upper surface of the mesa structure; and

a passivation layer formed on the mesa structure and having a contact hole exposing an upper surface of the current injection ridge.

2. (Previously Presented) The semiconductor laser device of claim 1, wherein the upper and the lower cladding layers are a p-GaN/AlGaN layer and an n-GaN/AlGaN layer, respectively.

3. (Original) The semiconductor laser device of claim 1, wherein the resonance layer includes:

a lower wave guide layer stacked on the lower cladding layer and having a greater refractive index than the lower cladding layer;

an active layer stacked on the lower wave guide layer that generates a laser beam; and

an upper wave guide layer stacked on the active layer.

4. (Previously Presented) The semiconductor laser device of claim 3, where the refractive indexes of the upper and the lower wave guide layers are less than the refractive index of the active layer and the upper and lower wave guide layers are GaN based group III-V compound semiconductor layers.

5. (Previously Presented The semiconductor laser device of claim 3, wherein the active layer is a semiconductor layer made of a GaN based group III-V nitride compound expressed as $In_xAl_yGa_{1-x-y}N$ where $0 \leq x \leq 1$, $0 \leq y \leq 1$, and $x+y \leq 1$.

6. (Previously Presented) The semiconductor laser device of claim 3, wherein the ridge is formed on the upper cladding layer, and a second compound semiconductor layer is formed on the current injection ridge.

7. (Previously Presented) The semiconductor laser device of claim 6, wherein the second compound semiconductor layer is a p-GaN based group III-V nitride semiconductor layer.

8. (Previously Presented) The semiconductor laser device of claim 3, wherein the substrate further includes an n-type electrode on the upper surface, and the substrate is a sapphire substrate having a gallium nitride (GaN) semiconductor material layer or a freestanding GaN substrate.

9. (Previously Presented) A semiconductor laser device, which includes a multi-semiconductor material layered mesa structure having a laser resonance

layer on a substrate and cladding layers formed above and below the resonance layer, comprising:

rounded corners connected to the substrate, in a lower portion of the mesa structure and configured to prevent concentration of a scribing force;

a current injection ridge and force distribution ridges formed on an upper portion of the mesa structure and protruding from an upper surface of the mesa structure; and

a passivation layer formed on the mesa structure and having a contact hole exposing an upper surface of the current injection ridge.

10. (Original) The semiconductor laser device of claim 9, wherein the upper and the lower cladding layers are a p-GaN/AlGaN layer and an n-GaN/AlGaN layer, respectively.

11. (Original) The semiconductor laser device of claim 9, wherein the resonance layer includes:

a lower wave guide layer stacked on the lower cladding layer and having a greater refractive index than the lower cladding layer;

an active layer stacked on the lower wave guide layer that generates a laser beam; and

an upper wave guide layer stacked on the active layer.

12. (Previously Presented) The semiconductor laser device of claim 11, where the refractive indexes of the upper and the lower wave guide layers are less

than the refractive index of the active layer and the upper and the lower wave guide layers are GaN based group III-V compound semiconductor layers.

13. (Previously Presented) The semiconductor laser device of claim 11, wherein the active layer is a semiconductor layer made of a GaN based group III-V nitride compound expressed as $In_xAl_yGa_{1-x-y}N$ where $0 \leq x \leq 1$, $0 \leq y \leq 1$, and $x+y \leq 1$.

14. (Original) The semiconductor laser device of claim 11, wherein the ridges are formed on the upper cladding layer, and a second compound semiconductor layer is formed on the central ridge.

15. (Original) The semiconductor laser device of claim 14, wherein the second compound semiconductor layer is a p-GaN based group III-V nitride semiconductor layer.

16. (Previously Presented) The semiconductor laser device of claim 11, wherein the substrate further includes an n-type electrode on the upper surface, and the substrate is a sapphire substrate having a GaN semiconductor material layer or a freestanding GaN substrate.

IX. EVIDENCE APPENDIX

X. RELATED PROCEEDINGS APPENDIX